CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this chapter, the details of the materials used for the mortar mix are presented. The selection of material such as sewage sludge, cement, sand and water is reviewed. Other than that, the methods of experimental works and tests that were carried out in this research are also discussed under this chapter. It includes the set-up and the procedure of the hardened properties test and composition test on the specimens. The hardened properties test comprise of compressive strength test and total porosity test while the chemical composition tests were carried out with XRD, XRF and FESEM tests. The flow chart in Figure 3.1 summarizes the flow of preparation of material and the test for this research.

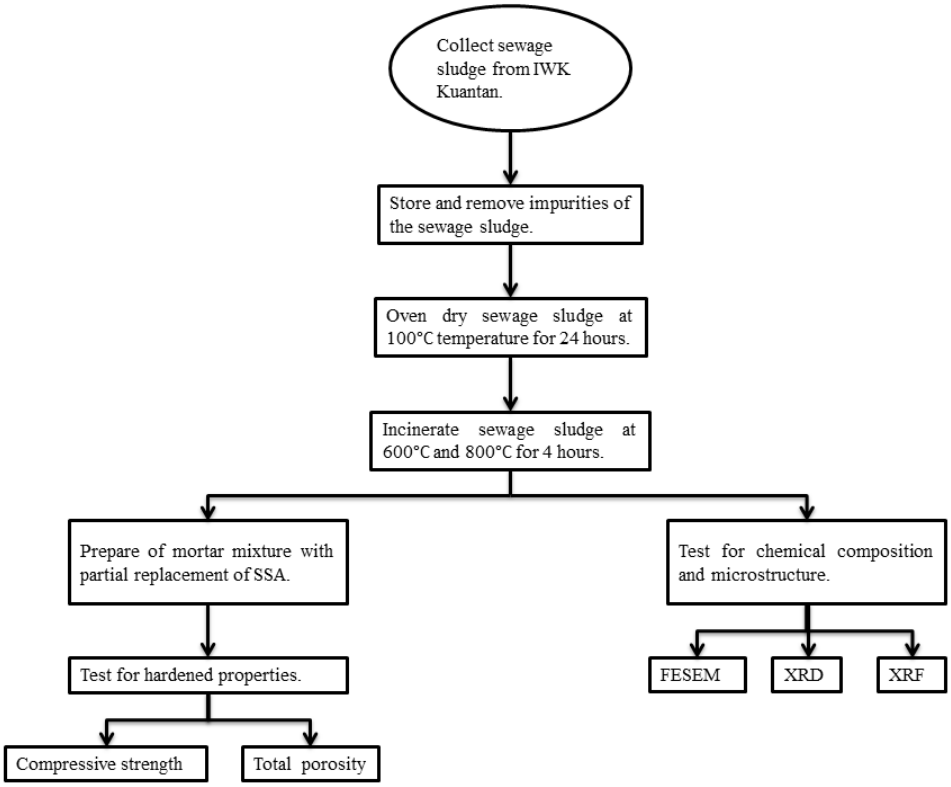

Figure 3.1: Flow chart showing the preparation of material and test

3.2 MATERIAL OF MORTAR PASTE

This sub-chapter presents the constituent materials that made up the mortar, which are sewage sludge ash, Ordinary Portland Cement, fine aggregate and water. The details of the materials are also stated here along with the proper handling method of each type of materials. The types of material are clearly presented at this sub chapter which is very important to ensure the quality of the mortar paste. The main specimen used in this research is mortar cube. The production of the mortar mix is decided according to ASTM C1329-05.

3.2.1 Sewage Sludge Ash

The sewage sludge used in this research was obtained from IWK Kuantan treatment plant. The sewerage treatment plant is located at Kuantan where the sewerage treatment plant is surrounded by mostly residential area and commercial area. The

sewage sludge that was obtained from the treatment plant is categorized as domestic sludge. At the sewerage treatment plant, the sewage sludge was sun dried at the sludge bed. Only the top part of the sludge bed were collected by using shovel as underneath the sewage sludge is fine sand which is function to filter the sewage sludge. The sewage sludge was collected into plastic bags and stored in a dry store room. Figure 3.2 shows the sewage sludge collected from water treatment plant. The sewage sludge was sun dried at the treatment plant but still has high moisture content. To further remove the moisture content, the sewage sludge sample was oven dried. Excess moisture content will affect the process of incineration.

Figure 3.2: Sewage sludge

The sewage sludge was oven dried in universal oven at 100℃ for 24 hour to lower the moisture content of the sample before incineration process. The removal of water is important to ensure the reaction during the incineration process is constant. Next, the oven dried sewage sludge was incinerated by using a furnace. The brand of the furnace is Carbolite which can operate up to maximum 1600℃ and maximum power of 8 kW. Figure 3.3 shows the Carbolite Furnace used in this research.